

Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Cathode Plasma Formation in High Intensity Electron Beam Diodes¹ MARK JOHNSTON, MARK KIEFER, BRYAN OLIVER, Sandia National Laboratories, NICHELLE BENNETT, DARRYL DROEMER, National Security Technologies, LLC, V. BERNSTAM, R. DORON, YITZHAK MARON, Weizmann Institute of Science — This talk will detail the experimental results and conclusions obtained for cathode plasma formation on the Self-Magnetic Pinch (SMP) diode fielded on the RITS-6 accelerator (4-7.5 MeV) at Sandia National Laboratories. The SMP diode utilizes a hollowed metal cathode to produce high power (TW), focused electron beams (< 3mm diameter) which are used for flash x-ray radiography applications. Optical diagnostics include high speed (< 10ns) framing cameras, optical streak cameras, and spectroscopy. The cathode plasma in this high electric (MV/cm) and magnetic (> 10 Tesla) field environment forms well-defined striations. These striations have been examined for a number of different cathode sizes, vacuum gap spacings, and diode voltages. Optical streak images have been taken to determine the time evolution of the plasma, and optical spectroscopy has been employed to determine its constituents as well as their densities and temperatures inferred from detailed time-dependent, collisional-radiative (CR) and radiation transport modelings. Comments will be made as to the overall effect of the cathode plasma in regards to the diode impedance and electron beam focusing.

¹Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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Date submitted: 12 Jul 2013

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